**PRACTICAL: 4**

*Calculation of Spearman’s Rank Correlation Coefficients.*

**FORMULA USED:**

1. **SPEARMAN’S RANK CORRELATION COEFFICIENTS:**
2. **SRCC WITH TIES:**

where,

D=R1-R2 (R1 and R2 denotes the rank of first and second variable)

‘m’ denotes the number of individuals bearing the same rank.

**QUESTION:1:** Two ladies were asked to rank seven different types of lipsticks. Find SRCC:

|  |  |  |
| --- | --- | --- |
| TYPE | R1 | R2 |
| 1 | 2 | 1 |
| 2 | 1 | 3 |
| 3 | 4 | 2 |
| 4 | 3 | 4 |
| 5 | 5 | 5 |
| 6 | 7 | 6 |
| 7 | 6 | 7 |

**ANSWER:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TYPE | R1 | R2 | D=R1-R2 | D^2 |
| 1 | 2 | 1 | 1 | 1 |
| 2 | 1 | 3 | -2 | 4 |
| 3 | 4 | 2 | 2 | 4 |
| 4 | 3 | 4 | -1 | 1 |
| 5 | 5 | 5 | 0 | 0 |
| 6 | 7 | 6 | 1 | 1 |
| 7 | 6 | 7 | -1 | 1 |

**CALCULATIONS:**

N3=343 (N=7)

Therefore, SRCC r=0.785714

**QUESTION 2:** Three Judges in a Beauty Contest rank 10 contestants as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| CONTESTANT NUMBER | JUDGE 1(R1) | JUDGE 2(R2) | JUDGE 3(R3) |
| 1 | 1 | 3 | 6 |
| 2 | 6 | 5 | 4 |
| 3 | 5 | 8 | 9 |
| 4 | 10 | 4 | 8 |
| 5 | 3 | 7 | 1 |
| 6 | 2 | 10 | 2 |
| 7 | 4 | 2 | 3 |
| 8 | 9 | 1 | 10 |
| 9 | 7 | 6 | 5 |
| 10 | 8 | 9 | 7 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CONTESTANT NUMBER | JUDGE 1  (R1) | JUDGE 2  (R2) | JUDGE 3  (R3) | D1  (R1-R2) | D12 | D2  (R2-R3) | D22 | D3  (R1-R3) | D32 |
| 1 | 1 | 3 | 6 | -2 | 4 | -3 | 9 | -5 | 25 |
| 2 | 6 | 5 | 4 | 1 | 1 | 1 | 1 | 2 | 4 |
| 3 | 5 | 8 | 9 | -3 | 9 | -1 | 1 | -4 | 16 |
| 4 | 10 | 4 | 8 | 6 | 36 | -4 | 16 | 2 | 4 |
| 5 | 3 | 7 | 1 | -4 | 16 | 6 | 36 | 2 | 4 |
| 6 | 2 | 10 | 2 | -8 | 64 | 8 | 64 | 0 | 0 |
| 7 | 4 | 2 | 3 | 2 | 4 | -1 | 1 | 1 | 1 |
| 8 | 9 | 1 | 10 | 8 | 64 | -9 | 81 | -1 | 1 |
| 9 | 7 | 6 | 5 | 1 | 1 | 1 | 1 | 2 | 4 |
| 10 | 8 | 9 | 7 | -1 | 1 | 2 | 4 | 1 | 1 |
|  |  |  |  |  | **200** |  | **214** |  | **60** |

**ANSWER:**

**CALCULATIONS:**

SRCC for Judge 1 and 2 , r= -0.212121212

SRCC for Judge 2 and 3, r=-0.296969697

SRCC for Judge 3 and 1, r=0.636363636

**QUESTION 3:** Calculate the SRCC for the height and weight of people in your class, and since the students may have same height and weight; use the SRCC formula for ties:

**ANSWER:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | HEIGHT | WEIGHT | R1 | R2 | D=r1-r2 | D2 |
| 1 | 120 | 45 | 33.5 | 17 | -16.5 | 272.25 |
| 2 | 118 | 59 | 23.5 | 53 | 29.5 | 870.25 |
| 3 | 119 | 55 | 29 | 45.5 | 16.5 | 272.25 |
| 4 | 135 | 50 | 55.5 | 35 | -20.5 | 420.25 |
| 5 | 110 | 51 | 4.5 | 38 | 33.5 | 1122.25 |
| 6 | 111 | 43 | 9.5 | 8 | -1.5 | 2.25 |
| 7 | 123 | 47 | 41.5 | 26 | -15.5 | 240.25 |
| 8 | 124 | 58 | 50.5 | 49.5 | -1 | 1 |
| 9 | 123 | 49 | 41.5 | 31 | -10.5 | 110.25 |
| 10 | 110 | 47 | 4.5 | 26 | 21.5 | 462.25 |
| 11 | 119 | 45 | 29 | 17 | -12 | 144 |
| 12 | 118 | 43 | 23.5 | 8 | -15.5 | 240.25 |
| 13 | 117 | 54 | 18 | 42 | 24 | 576 |
| 14 | 123 | 43 | 41.5 | 8 | -33.5 | 1122.25 |
| 15 | 112 | 65 | 12.5 | 56 | 43.5 | 1892.25 |
| 16 | 119 | 45 | 29 | 17 | -12 | 144 |
| 17 | 111 | 34 | 9.5 | 2.5 | -7 | 49 |
| 18 | 123 | 54 | 41.5 | 42 | 0.5 | 0.25 |
| 19 | 124 | 45 | 50.5 | 17 | -33.5 | 1122.25 |
| 20 | 110 | 45 | 4.5 | 17 | 12.5 | 156.25 |
| 21 | 117 | 59 | 18 | 53 | 35 | 1225 |
| 22 | 123 | 50 | 41.5 | 35 | -6.5 | 42.25 |
| 23 | 112 | 51 | 12.5 | 38 | 25.5 | 650.25 |
| 24 | 119 | 58 | 29 | 49.5 | 20.5 | 420.25 |
| 25 | 110 | 49 | 4.5 | 31 | 26.5 | 702.25 |
| 26 | 117 | 47 | 18 | 26 | 8 | 64 |
| 27 | 123 | 54 | 41.5 | 42 | 0.5 | 0.25 |
| 28 | 123 | 45 | 41.5 | 17 | -24.5 | 600.25 |
| 29 | 124 | 34 | 50.5 | 2.5 | -48 | 2304 |
| 30 | 110 | 49 | 4.5 | 31 | 26.5 | 702.25 |
| 31 | 117 | 47 | 18 | 26 | 8 | 64 |
| 32 | 123 | 45 | 41.5 | 17 | -24.5 | 600.25 |
| 33 | 118 | 43 | 23.5 | 8 | -15.5 | 240.25 |
| 34 | 135 | 54 | 55.5 | 42 | -13.5 | 182.25 |
| 35 | 110 | 43 | 4.5 | 8 | 3.5 | 12.25 |
| 36 | 123 | 65 | 41.5 | 56 | 14.5 | 210.25 |
| 37 | 119 | 45 | 29 | 17 | -12 | 144 |
| 38 | 123 | 45 | 41.5 | 17 | -24.5 | 600.25 |
| 39 | 123 | 58 | 41.5 | 49.5 | 8 | 64 |
| 40 | 112 | 54 | 12.5 | 42 | 29.5 | 870.25 |
| 41 | 123 | 45 | 41.5 | 17 | -24.5 | 600.25 |
| 42 | 123 | 55 | 41.5 | 45.5 | 4 | 16 |
| 43 | 119 | 50 | 29 | 35 | 6 | 36 |
| 44 | 110 | 58 | 4.5 | 49.5 | 45 | 2025 |
| 45 | 119 | 47 | 29 | 26 | -3 | 9 |
| 46 | 124 | 43 | 50.5 | 8 | -42.5 | 1806.25 |
| 47 | 110 | 45 | 4.5 | 17 | 12.5 | 156.25 |
| 48 | 117 | 34 | 18 | 2.5 | -15.5 | 240.25 |
| 49 | 123 | 51 | 41.5 | 38 | -3.5 | 12.25 |
| 50 | 117 | 49 | 18 | 31 | 13 | 169 |
| 51 | 117 | 59 | 18 | 53 | 35 | 1225 |
| 52 | 112 | 34 | 12.5 | 2.5 | -10 | 100 |
| 53 | 126 | 49 | 53 | 31 | -22 | 484 |
| 54 | 134 | 46 | 54 | 23 | -31 | 961 |
| 55 | 136 | 56 | 57 | 47 | -10 | 100 |
| 56 | 118 | 65 | 23.5 | 56 | 32.5 | 1056.25 |
| 57 | 120 | 43 | 33.5 | 8 | -25.5 | 650.25 |
|  |  |  |  |  | **0** | **28565** |

**CALCULATIONS:**

SRCC, r=-0.120592429

**INFERENCE:**

In question 1, the SRCC value is very close to 1, hence the two ladies think quite alike. They both rated the lipstick almost similarly.

In second question, the value of SRCC is calculated in pairs of Judges 1, 2, 3 , upon calculation it can be inferred that , the Judges 1 and 3 think quite alike, 63% of the time their judgement is same , wherein judges 2 and 3 think quite differently .

In third question, we calculated SRCC for the observed height and weight of students of our class, in which we inferred that the height and weight are not correlated. The value of SRCC is negative and is towards 0, which means, there is a very slight negative relationship between the two.